

Linux in the World of Telephony

The increasing uptake of Linux is not slowing, with the operating system setting its sights on the telecomms industry. Stephen Coates examines the incorporation of Linux into telecomms hardware and software platforms.

Pick up a computer magazine and there will be something on Linux. More and more commercial products are able to work on it, it is enjoying an increasing uptake and there are even conferences devoted to it. Most significantly, it is actually challenging Microsoft's cherished Windows range of operating systems. Linux is particularly well established in China (where it is reported to be more widely used than Windows) and Korea.

Linux can be used for a wide variety of applications and is particularly popular for Internet servers. More recently Linux has begun to make its debut within the domain of telephony.

The roots of Linux go back to the 1970s when Richard Stallman, having relished the academic environment in which software and its source code was relatively freely exchanged between interested persons, established the GNU (GNU's Not Unix) project while at Massachusetts Institute of Technology (MIT) in 1973. He subsequently left MIT and developed GNU C compiler and GNU Emacs editor.

Open Software

Core to GNU is the GNU Public Licence (GPL), a condition by which software and source code is supplied at low cost, but which requires that any new software developed from or using software subject to GPL is itself subject to GPL. In contrast to that produced by Microsoft and others, such software can rightly claim to be 'open'.

Fast forward to 1991. Linus Torvalds, then a student at the University of Helsinki, released the source code of an operating system he had been developing for a 386 in an attempt to improve on Minix, a variant of Unix. He released it under the GNU General Public Licence for others to use, improve upon and distribute as they saw fit. This was the first version of Linux.

To understand Linux, one must have some appreciation of the development of computing. From its origins at the closing stages of WWII until the 1960s, computing really was a science, undertaken by lab-coat wearing computer

scientists who built machines, wrote assembler languages, developed operating systems and so on in an atmosphere of research and discovery.

Computing evolved from science to engineering to the point where today it more resembles a highly paid trade whose practitioners can be considered software technicians. For those who prefer to eschew shrink-wrapped software packages and long for the challenge of cutting code at the operating system level, Linux is very attractive. Linux is



perhaps the last bastion of the pro-peller-head, and it's a large and growing bastion at that, but it really does offer the scope to develop capabilities that the alternatives cannot.

Growth

From these humble beginnings, the uptake of Linux has grown explosively and, due to the open source environment, organically as tens of thousands of programmers contribute code, modules and other extensions to this body of applications. The current version of the Linux operating system, version 2.2, was released in January 1999.

Linux is available in several dialects which are referred to as distributions. The seven most widely used are Red Hat (widely used in the US), Caldera, Suse, Corel, Debian, Slackware and Turbo-Linux (widely used in Asia). Each distribution has its own set of attributes and functions. They are not necessarily free. Developers may charge for their software, but the source code must be provided with it. It is this legacy of the GNU environment that has led to so much Linux software being developed, and available.

As a variant of Unix, Linux has been able to run just about all of the Unix application software that exists, from games to scientific applications that run on a number of processors in parallel. And as the TCP/IP protocol stack and all of the original Internet server software was written for Unix, it has been easily ported to Linux.

The Unix beginnings have also seen Linux develop in a culture comprising people who really understand what they are doing and typically have a network of contacts who do likewise. Such people relish having the source code which allows tweaking of applications if and when required.

The Linux operating system is modular, comprising a very compact kernel to which modules offering the

required functionality are able to be loaded into memory if and when required. Linux can thus work very well with only 8MB of RAM. This is one advantage which differentiates it from Unix as no developer of Unix appears able or willing to offer a variation of Unix with only the capabilities required for telephony applications.

Another strength of Linux's Unix heritage is its stability. Linux machines have a reputation of being able to operate for months, even years without crashing or otherwise failing. Although viruses for Linux do exist, the security of Linux means that there are very few of them.

Telephony Systems

The world of telephony comprises a number of different system categories, each with its own considerations and parameters. At the core of any telephony environment are switches – PABXs and central office exchanges. Such systems are typically modular in construction, with the largest systems comprising several racks of interface circuits connected by time division buses to one or more time division switches, controlled by a CPU. Although highly configurable and controllable through a number of interfaces, the hardware and software of a switch is sold as an indivisible package which rarely includes any facilities for users to perform their own software development.

The paramount consideration of a switch's operating system is reliability. Such an operating system must perform only the one function – switching calls – and it must be able to do this for years without interruption.

Therefore, most switches use operating systems which are proprietary, or specific to the switch manufacturer. But there are exceptions. Selta (Tortoreto, Italy) and SALIX (Maryland, US) both use the pSOS operating system for their SAE 3000

PABX and ETX5000 exchange, respectively. pSOS was developed by ISI, itself recently acquired by Mindriver. And ACD manufacturer Rockwell uses Windows NT for its smaller Transcend ACD and OS/9 for the larger RICCS system. Al Hukle, Rockwell's manager of electronic marketing, said that Rockwell selected OS/9, a product of Microware Systems (Iowa, US), because of its "exceptional ability to handle multiple real-time tasks simultaneously and its reliability when used in critical applications".

But Linux has made its presence felt. eOn Communications (formerly BCS Technologies, Georgia, US) has been using Linux as the operating system of its DSP1000 ACD since 1997. Gary Spears, eOn's director of the international division explained "we chose Linux because it gave us access to the latest technology. There are many more people developing drivers and building applications for Linux than for any other operating system that will suit our needs. Linux has a fantastic real-time kernel and a massive driver library that is being expanded by programmers world wide on a continual basis."

At least some other manufacturers are more than interested. Pete Tuckerman, vice president of product management of Teltronics (Florida, US) advised that Teltronics has chosen Linux as the operating system for the new central processor it is developing for its Vision PABX.

The advantages cited by Tuckerman were cost, stability and its open source. "This is critical for a PABX company. Open source allows us to tune the operating system to our needs. There is also the development environment in which there are many new, powerful application development tools and many bright people constantly improving Linux and adding new capabilities."

Another category of telephony systems includes interactive voice response (IVR) systems, voice mail systems and audio call recording systems, the last of which are also referred to as call logging systems. Such systems typically comprise a number of voice interface circuits to the switch and a CPU. IVR systems usually have a LAN interface and audio call recording systems have high capacity disk or tape storage. Although there are some systems which offer two of these three functions, most such systems are standalone and perform the one function only.

In contrast to PABXs and exchanges, most IVRs, voice mail systems and call loggers are manufactured by smaller companies using readily available components, the most significant of these being circuit cards from 30 odd suppliers of such products, including Aculab, Natural MicroSystems, Brooktrout and Dialogic. Circuit cards come with drivers written for a specific operating system.

Many such companies are now offering Linux drivers, but only quite recently – for example Natural MicroSystems announced broad support for Linux only this year. The availability of such drivers does, nonetheless, remove what has been a technical barrier to the use of Linux by such systems.

Drivers

IBM's OS/2 was, until recently, the preferred operating system for small- to medium-sized IVR systems, but few systems now use it, as few current circuit boards come with OS/2 drivers. From the suppliers informally surveyed, two thirds use Windows NT only and one third use either Windows NT or Unix, the latter being the operating system of choice for larger, telco-grade systems.

But perception remains. More than one IVR developer has commented

that although OS/2 was a better platform, many customers were insisting on Windows NT. But why? Without exception, IVR, voice mail and audio call recording systems are dedicated to the one application. They do not double as file servers or desktops. As long as the system supports a few utilities such as one to perform back-ups, the operating system is irrelevant. But corporate standards are corporate standards. The only use of Linux within this category of products the author could find was for some of InterVoiceBrite's IVR products for the telco environment.

The third category of telephony systems comprise client/server CTI systems within the realm of the call centre, predictive diallers and products which support collaborative Internet browsing by interfacing Internet site hosts to both PABXs and agent desktops. Such CTI systems are centred on a server which is interfaced to the switch, to one or more enterprise computers and to client applications on the users' desktops. Although some older systems also have their own trunks and/or extensions, predictive diallers have essentially the same architecture as call centre/desktop CTI applications.

All such systems support one or more variations of Windows on the desktop and many also support other PC operating systems, including Unix, MacIntosh and Linux to work with the client's existing infrastructure. But the server is different. Eighty percent of the vendors informally surveyed use only Windows NT, ten percent use either Windows or Unix and the other ten percent, some of which can also use Windows and/or Unix, will also run on other operating systems, including NetWare, DOS and IBM's AS/400.

At first glance, if Linux was to make major inroads into the telephony world, this is where it would start. A survey conducted by the Internet Operating System Counter in April 1999 found

Linux to be the most popular single operating system, being used by 31 percent of the ISPs polled. And a recent survey by IDC found Linux to be a major competitor to Windows and Unix for server applications, with 13 percent of companies polled using Linux, compared to less than one percent in 1997.

In fact, although progress is still slow, within the broad domain of telephony, it is for these applications that Linux is enjoying the greatest, albeit still modest, uptake:

- Consol's (Munich, Germany) Call-Manager CTI system runs on nearly all available operating systems including Linux. Sales manager and software consultant at Consol, Eike Reinel, noted that "a large number of new customers choose Linux as their server operating system";
- The Dialect suite from CTI Labs (New Jersey, US) is available on Windows NT, Windows 9X, Linux and Unix. CTI Labs' Cliff Wener gave a similar reason, "we are using it to ensure that our products may be used by any of our clients that choose Linux to be their platform";
- Privacom's (Rotterdam, Netherlands) Call Me Now! collaborative browsing system is able to run on Windows NT, Solaris, Unix and Linux;
- iLink's (Berlin, Germany) TeamCall CTI server already runs on Linux;
- In December 1999, eShare (formerly Melita) of Georgia, US, announced support of the Linux operating system for its Web-based communication products, but the announcement made no mention of its predictive dialler;
- Initiative Software (Glasgow, Scotland) is planning to port its SynTelate CTI-capable sales and marketing system to Linux this year;
- Ryan Technology (California, US) is similarly planning to port its Call Control (CTI) Server onto Linux by the end of this year;
- Rockettalk (California, US), whose product of the same name is an Inter-

net voice messaging application, uses Windows NT, but is beta testing a Java version which will run on Linux. Jefferson Lanz, RocketTalk's commander of business development commented: "We believe that communication applications must be ubiquitous in order to survive.";

- Clearwave is developing Linux support for their Intellect personal CTI product; and
- Open Access's (Crows Nest, NSW) Infoserver is available on Linux as well as Unixware and Windows NT. Many other suppliers are considering Linux, with the most commonly cited advantages being its low cost, robustness, ability to be implemented on older machines such as 386s and the ability to service that small but growing sector of the market that prefers it.

A favourable opinion of Linux remains, however, a minority opinion and the above-cited developments remain the exception rather than the rule.

The Disadvantages of Linux

Many developers of CTI products and predictive diallers that used only Windows NT cited as a disadvantage the investment in staff skills and the time necessary to port their product to Linux while still supporting it on Windows. Another disadvantage cited was the multiplicity of versions of Linux with no one source of support for any of them,

worldwide. A third disadvantage was the lack of suitable development tools.

Whereas Dialogic has announced Linux drivers' circuit cards, it has no immediate plans to port its CT Media development platform onto Linux. Similar products from Envoy and Ring! also use Windows NT, although Ring! is considering porting the run time of its iMPACT application generator to SCO Unix and/or Linux.

The fourth category of telephony systems are PC-based telephone systems, also sometimes referred to as UnPABXs – telephone systems that use the standard PC architecture for the main chassis. There are about 50 such systems commercially available in various parts of the world. Sixty percent of those vendors responding to the informal survey use the Windows operating system and another 20 percent use either Windows or NT. The remaining 20 percent use other operating systems, including VxWorks, pSOS, DR-DOS and OS/2.

UnPABXs

No such systems yet use Linux, but there have been some announcements. Picazo Communications and Voice Communications (both based in California, US) have announced the LinBX and evoice3000L – respectively, Linux-using equivalents of their existing VS1 and evoice3000 PC-based telephone

systems, both to be released later this year. London, UK-based Macfarlane Telesystems is planning Linux support for the CallPlus system of the same type.

Vendors of such systems cited similar advantages and disadvantages of Linux. One vendor cited its newness and another the need to synchronise software with new releases of Linux.

Outside of telephony, Linux is also being used by Core Networks (CoreOS Broadband Provisioning and Management System), Quicknet (VoIP circuit cards) and White Pine (MeetingPoint IP conference server). The Motorola Computer Group is now using Linux for embedded systems it develops.

How these products will be accepted remains to be seen. One of the perceived disadvantages cited by a number of developers of telephony systems of all types was market expectations. This comes back to the issue of why. Given that no sane administrator of a PC-based telephone system, CTI system or IVR would put any other applications on its server, just what operating system that server is using is of very little relevance. Prudence would have such a system selected on its merits, not its operating system, but prudence is all too often overridden by blind preferences.

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